

Taxation of Multinationals in the Presence of Internal Capital Markets*

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Abstract

Previous literature on multinational taxation shows that investment allocations in multinationals are tax sensitive and generically lower in divisions that are located in high-tax jurisdictions. Agency problems in multinational enterprises (MNEs) are rarely explicitly accounted for. In this paper, we analyze whether internal capital markets and the inherent disincentive effects for division managers influence the way countries behave in fiscal competition. We show that the disincentive effect in itself may lead to too high (low) profit taxes in the country in which agency costs are more (less) sensitive to taxes. Differently, agency costs unambiguously render infrastructure provision inefficiently low. We clarify the implications of the size of the internal capital market and the MNE's decision to set up an internal capital market for the efficiency results.

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1 Introduction

Capital mobility severely constrains the ability of governments to impose taxes on profits. Firms try to locate capital and, thereby, profits in countries where taxes are low. To limit the outflow of the tax base, governments are tempted to set taxes at an inefficiently low level (e.g., Zodrow and Mieszkowski, 1986; Wilson, 1986, and, for a review, Wilson and Wildasin, 2004). Cross-country tax rate differences particularly incentivize multinational enterprises (MNEs) to adopt tax avoidance strategies.¹ They have an advantage in relocating capital and profits compared with stand-alone firms. MNEs may shift profits by strategically pricing internally traded goods and services or by using internal debt finance. Also, most MNEs run an internal capital market which allows the headquarter of the MNE to flexibly locate capital between divisions of the MNE in order to raise the overall profitability of the firm. The MNE can thereby exploit unforseen investment opportunities in divisions in the same way as relocating capital from high-tax countries to low-tax countries.²

In this paper, we analyze the implications internal capital markets have for fiscal competition. Unlike the existing tax competition literature, we consider that an internal capital market not only allows for a flexible allocation of capital (the so-called bright side of the internal capital market), but also entails an agency cost for the MNE, frequently referred to as the dark side of internal capital markets. We show that agency costs are in general not neutral for how governments decide on taxes levied on MNEs. Agency costs are responsive to taxes and the sensitivity of agency costs may, in fact, counteract the downward pressure on taxes in fiscal competition and incentivize governments to underprovide infrastructure goods. Agency costs influence the way MNEs shape government policy through changes in the size of the internal capital market (intensive margin) and the decision whether to set up an internal capital market (extensive margin).

The issue of how taxes influence the decision of a MNE to invest in different countries is widely analyzed in the literature on tax competition. See, for instance, Hines (1997), Gresik (2001) and Griffith et al. (2010) for a review. The common finding is that MNE investments tend to be sensitive to taxes and generically lower in countries with higher taxes. The theoretical

¹Hines (1999) and Gresik (2001), among others, provide an overview of how decision of MNEs are influenced by tax avoidance considerations.

²See, e.g., Hubbard and Palia (1999) and Desai et al. (2005) on the working of internal capital markets in MNEs and, in particular, Desai et al. on how internal capital markets can facilitate tax minimization.

literature abstracts from agency problems that are related to the allocation of investment within MNEs.³

The way capital is allocated in internal capital markets is a central issue in the corporate finance literature (e.g., Stein, 1997, Scharfstein and Stein, 2000, Brusco and Panunzi, 2005, and Inderst and Laux, 2005). Therein, the argument is that internal capital markets ensure an efficient allocation of resources across divisions. This, however, may undermine incentives by division managers to exert productive effort which results in lower division cash flow and/or less investment opportunities.⁴ The papers do not analyze the role of taxes for investment behavior of MNE divisions, which are linked by an internal capital market, and its implications for government policy.

We set up a model of a MNE with two divisions which are located in different countries. The two divisions are linked via an internal capital market which allows the headquarter to flexibly re-allocate resources across divisions in response to the arrival of new investment opportunities. The agency problem within the MNE is due to the fact that managers exert non-verifiable effort to generate cash flow. The headquarter has the residual control rights over the use of division cash flow and may re-allocate it to the other division to enhance overall productivity or to minimize tax payments. Fiscal competition between the two jurisdictions influences (i) the capital allocation in the internal capital market and (ii) the provision of effort by each division manager. The latter incentive effect exists because the division manager is aware that any increase in the local tax rate causes the headquarter to reallocate resources towards the other jurisdiction which undermines incentives to exert effort. Both effects may have opposite implications for the uncoordinated choice of taxes. While the reallocation effect implies that taxes are inefficiently low through the standard positive tax competition externality, the effect which works through effort provision may result in inefficiently high profit taxes. The rational is that lower effort and, thereby, cash flow spills over to the other country's tax base through the internal capital market, hence generating a negative fiscal externality. Differently, infrastructure

³An alternative tax avoidance strategy of MNEs is to strategically price intra-firm trade (e.g., Haufler and Schjelderup, 2000). In such a setting, Elitzur and Mintz (1996) analyze how agency problems influence the behavior of government in tax competition. The nature of the tax avoidance strategy and, also, the agency problem differ from what we explore. Schjelderup and Schindler (2008) analyze how a conflict of interest between shareholders affects the strategic use of debt in MNEs to lower tax payments. Instead, we focus on real investment responses, an agency conflict between division managers and the headquarter, and on the efficiency implications for non-cooperative tax rate choices.

⁴See, e.g., Berger and Ofek (1995) and Scharfstein and Ozbas (2010) for empirical evidence on the existence of inefficiencies in internal capital markets.

provision may reinforce incentives to exert effort, thereby generating a positive fiscal externality. The finding is in contrast to the prediction of conventional models of fiscal competition (e.g., Keen and Marchand, 1997). Besides observing changes in managerial effort levels, the MNE may also respond to government policy by setting up an internal capital market. Although an internal capital market allows the MNE to minimize its tax obligation, it will not always decide to set up an internal capital market in response to higher taxes. In particular, infrastructure provision magnifies the negative effect of taxes on managerial effort choices. As such, a tax rise in an infrastructure-rich country increases the agency cost of using an internal capital market, hence providing a policy-related dark side of internal capital markets.

The paper is organized as follows. Section 2 presents the model. Section 3 analyzes the behavior of the MNE and governments in the absence of managerial effort choices. Section 4 considers the effect of effort choices on MNE behavior and government tax policy. Section 5 turns to government infrastructure policy. The incentives to set up an internal capital market and the role of government policy is analyzed in Section 6. Section 7 provides a summary of the results and draws some conclusions.

2 Model Set-up

We consider a multinational enterprise (MNE) with two divisions each of which is located in a different country. Each division is run by a manager who derives utility from the size of the division net of the cost of effort provision. Hence,

$$u_i = \theta E(k_i) - \phi(e_i), \quad \theta > 0. \quad (1)$$

k_i denotes the size of the division, as measured by the capital stock, and $\phi(e_i)$ is the manager's cost of effort provision where $\phi(e_i) = \omega/2e_i^2$, $\omega > 0$. Effort is denoted by e_i and is non-verifiable. The fact that k_i , i.e. the size of the division, enters the division manager's utility function reflects a desire to build empires as measured by the amount of capital employed in the division. The assumption that empire-building is a prime motivation for division managers conforms with the view on how division managers behave in MNEs with internal capital markets, see, e.g., Stein (1997), Scharfstein and Stein (2000), and Inderst and Laux (2005).

Each division starts with an investment project whose final return characteristics only become known in the course of time. In particular, the amount of capital employed by each division

accumulates over two periods: Each division's investment project generates some amount of cash flow, x_i . The manager may exert effort e_i to increase the profitability of the investment and therewith the amount of cash-flow which is available in division i at the end of period 1 (e.g., Brusco and Panunzi, 2003). The cash-flow production function is $x_i(e_i) = a_i e_i$, $a_i > 0$. The division managers' capability to enhance first period's investment profitability may vary across countries, i.e. we assume $a_i \geq a_j$. We, thereby, allow for the possibility that the two division locations are asymmetric w.r.t. the capability to generate cash flow by offering different levels of infrastructure or of human capital of workers that the manager uses in the local division. We endogenize the productive endowment of the two countries in Section 5.⁵

The divisions are linked by an internal capital market in which the headquarter is able to capture the divisions' cash flow and to allocate it across divisions so as to enhance the overall firm profitability. In particular, the headquarter re-allocates funds to the division which has the more profitable investment project and, hence, generates higher output levels in the second period. Output at the end of period 2 is given by

$$y_i = \alpha_i f(k_i) = \alpha_i k_i^\beta, \quad \text{with } \alpha_i > 0 \quad \text{and} \quad 0 > \beta > 1. \quad (2)$$

The productivity parameter α_i is stochastic ex-ante, i.e. at the beginning of period 1. The headquarter and the division managers only learn at the end period 1, after the two managers have decided on their effort levels, which division has the most profitable investment project. The productivity realization can take values $\bar{\alpha} > \underline{\alpha} > 0$ and it is perfectly negatively correlated across divisions. With probability $p \in (0, 1)$ the headquarter and the division managers learn that division 1's project yields a higher return before tax, i.e. $\alpha_1 = \bar{\alpha}$ and $\alpha_2 = \underline{\alpha}$. With probability $1 - p$ the opposite constellation, $\alpha_1 = \underline{\alpha}$ and $\alpha_2 = \bar{\alpha}$, occurs.

Division i 's profits are taxed at source at rate τ_i .^{6,7} Thus, expected profit of the multinational firm is

⁵We could equally allow for heterogeneity in the cost of effort provision (ω) and in the intensity of empire-building preferences (γ) across managers. For simplicity, we will confine attention to the heterogeneity of the managers capability to generate cash flow as a source of heterogeneity, but will comment on how to modify the analysis to account for multi-dimensional heterogeneity of divisions.

⁶Despite the complexity of international tax treaties, there is a widely held presumption that the source principle of taxation is effectively in place. See, e.g., Devereux et al. (2002).

⁷For simplicity, first-period output (cash-flow) is not taxed. We thereby focus on tax effects which influence effort choices via the internal capital market.

$$\begin{aligned}
E(\pi) &= p [(1 - \tau_1)\bar{\alpha}f(\bar{k}_1) + (1 - \tau_2)\underline{\alpha}f(\underline{k}_2)] \\
&+ (1 - p) [(1 - \tau_1)\underline{\alpha}f(\underline{k}_1) + (1 - \tau_2)\bar{\alpha}f(\bar{k}_2)].
\end{aligned} \tag{3}$$

The variables \bar{k}_i (\underline{k}_i) denote the amount of capital the headquarter allocates to the high-performing (low-performing) division i .

The chosen two-stage set-up allows for a comprehensive, but still analytically tractable way to model the two sides of the internal capital market. In particular, the first stage captures the fact that the cash flow of a firm is endogenous and, in particular, related to the managers' level of effort provision. Hence, the amount of capital which the headquarter redistributes at the second stage enhances overall productivity ex-post, but impairs incentives to generate cash flow ex-ante. We should note that the essential model ingredient is that cash-flow is sensitive to manager behavior. In most parts of the paper, we could drop the assumption of ex-post differences in division productivity while preserving the main findings of the paper.⁸ In this case, divisions would be symmetric ex-post in terms of productivity, $\alpha_i = \alpha_j$. The ability of the headquarter to redistribute capital would only amount to align the marginal productivity of capital (out of equilibrium), for a symmetric productivity level of the two divisions.

The governments in jurisdictions i and j compete for profits of the local division by setting the profit tax rate non-cooperatively. The tax proceeds in each jurisdiction are spent on public goods which are consumed by the local population.

In sum, the timing of the model is as follows: At stage 0, the two jurisdiction engage in fiscal competition and set their tax rates non-cooperatively. At stage 1, each division manager chooses the effort level e_i which determines the amount of cash-flow x_i , available in division i . At stage 2, the headquarter and the division managers learn the divisions' profitability and the headquarter re-allocates resources, i.e. cash-flow $x_1 + x_2$, across divisions so as to enhance the overall profitability of the MNE. Finally, production takes place and the firm is liquidated. We solve the game by backward induction.

⁸The bright side of the internal capital market is indispensable to the analysis in Section 5 where it pins down the equilibrium choice of whether to run an internal capital market.

3 The Bright Side of Internal Capital Markets

In the remainder of the paper we are interested in isolating the various effects an internal capital market has for the efficiency of decentralized tax policy choices. In doing so, we first solve the model by neglecting effort provision by division managers. The assumption implies that division manager's production in the first period, x_i is independent on the level of effort provision, e_i .

At stage 2, the divisions' profitability is already revealed. Consider division i is of high productivity and division j is of low productivity, $\alpha_i = \bar{\alpha}, \alpha_j = \underline{\alpha}$. Upon learning the divisions' productivity, the headquarter chooses the capital allocations $k_i = \bar{k}_i$ and $k_j = \underline{k}_j$ so as to maximize the overall profitability of the MNE. The headquarter thereby solves

$$\begin{aligned} \max_{\bar{k}_i, \underline{k}_j} \quad \pi &= (1 - \tau_i)\bar{\alpha}f(\bar{k}_i) + (1 - \tau_j)\underline{\alpha}f(\underline{k}_j) \\ \text{s.t.} \quad x_1 + x_2 &\geq \bar{k}_i + \underline{k}_j. \end{aligned} \tag{4}$$

The first-order condition is

$$(1 - \tau_i)\bar{\alpha}f'(\bar{k}_i) = (1 - \tau_j)\underline{\alpha}f'(\underline{k}_j). \tag{5}$$

The headquarter re-allocates capital so as to align the net-of-tax marginal productivity of capital across divisions. It is the allocative advantage associated with favoring well-performing divisions which is the "bright side" of the internal capital market. Given (2), the amount of capital allocated to each division is

$$k_i = \left(1 + \left(\frac{(1 - \tau_j)\underline{\alpha}}{(1 - \tau_i)\bar{\alpha}}\right)^{\frac{1}{1-\beta}}\right)^{-1} X \quad \text{and} \quad k_j = \left(1 + \left(\frac{(1 - \tau_i)\bar{\alpha}}{(1 - \tau_j)\underline{\alpha}}\right)^{\frac{1}{1-\beta}}\right)^{-1} X, \tag{6}$$

where $X = x_i + x_j$ is the total amount of cash flow which the headquarter distributes in the internal capital market. The high-performing division receives a larger share of cash flow X than the low-performing division. The respective shares depend on the profit taxes, the productivity parameters and the shape of the production function. Straightforwardly, a higher profit tax in the host country of a division reduces the share of the cash flow which is allocated to it through the internal capital market, independently of the productivity realization. Also, the share the high-performing (low-performing) division receives is increasing (decreasing) in the productivity differential, $\bar{\alpha} - \underline{\alpha}$, and decreasing (increasing) in the concavity of the production function, β .

3.1 Tax Policy

In evaluating the welfare effects of non-cooperative profit taxation, we assume that residents in country i own a share $\gamma_i \in (0, 1)$, $\gamma_1 + \gamma_2 = 1$, of the MNE and that managers reside outside the two countries.⁹ Under these assumptions, welfare of country i depends on expected MNE profits $E(\pi)$ (c.f. (3)), which accrue to residents of country i at a rate γ_i , and on the resident's valuation of expected tax revenues:

$$\gamma_i E(\pi) + \lambda_i \tau_i E(TB_i) \quad \text{with } \lambda_i > 1. \quad (7)$$

λ_i is the citizen's valuation of tax revenues and $E(TB_i)$ denotes the expected tax base in country i which follows from multiplying the ex-post tax base $\alpha_i f(k_i)$ by the relevant probabilities.

To analyze the efficiency of country i 's tax policy, we characterize the externality a country's tax choice exerts on welfare in the neighboring country. Thereby, we analyze how tax policy choices differ from those which result from a coordination of tax policies between the two countries. The effect of country i 's tax choice on country j 's welfare is

$$\underbrace{\gamma_j \frac{E(\pi)}{d\tau_i}}_{<0} + \lambda \tau_j \underbrace{\frac{dE(TB_j)}{d\tau_i}}_{>0}. \quad (8)$$

The first term marks a tax exporting effect: Since a fraction γ_j of the MNE is owned by citizens in country j , a share γ_j of the drop in MNE profit is exported onto country j . This results in a standard tax exporting externality (e.g., Huizinga and Nielsen, 1997). Note, the change in MNE profits is only due to a mechanical effect. The reallocation of capital between divisions at stage 2 does not affect overall MNE profit, an implication which follows from the application of the envelope theorem.

The second term reflects the working of the internal capital market. Following a tax increase in country i , the headquarter reallocates cash-flow from country i towards country j . The reaction signs the tax base effect in country j positive. Thus, the internal capital markets generate a positive fiscal externality which, in itself, points to undertaxation of profits in country i . It is this externality which is standardly related to the result of a "race to the bottom" in tax competition, in the sense that tax competition yields lower tax rates than coordination. We

⁹The latter assumption simplifies the analysis without invalidating the basic insights. Alternatively, managers may reside in the country, but the mass of managers in the population is relatively small and, hence, the policy-induced utility change may be negligible relative to the change that the rest of the population experiences.

summarize the last observation as follows:

Proposition 1: *In the absence of managerial effort choices, the internal capital market in itself gives rise to a positive fiscal externality. It thereby incentivizes countries to compete for profits and, thereby, to reduce profit taxes below the coordinated level.*

The overall efficiency implications of decentralized tax policy, however, are ambiguous. Given the negative tax-exporting externality, the reduction in the profit tax, initiated by the internal capital market, may not reduce welfare.

4 The Dark and Bright Side of Internal Capital Markets

We now re-introduce the disincentive effect of internal capital markets which is related to the provision of effort by division managers. The headquarter's behavior is exactly as before, i.e. it re-allocates capital across the divisions so as to maximize overall profitability of the MNE. The first-order condition is given by (5) and the associated capital allocation is (6). The only difference is that the amount of cash-flow available in the internal capital market now depends on the effort choice by division managers, changing the definition of total cash flow X in Eq. (6) to

$$X = x_i(e_i) + x_j(e_j). \quad (9)$$

At stage 1, the division managers choose the level of effort which in turn influences the amount of cash flow which is generated in the division in the first period. Division manager 1 maximizes

$$\theta (p\bar{k}_1 + (1-p)\underline{k}_1) - \phi(e_1) \quad \text{s.t.} \quad (6) \text{ and } (9). \quad (10)$$

The formulation for division manager 2 is analogous. The first-order condition of division manager 1's problem is

$$\theta \left(p \frac{d\bar{k}_1}{de_1} + (1-p) \frac{d\underline{k}_1}{de_1} \right) - \phi'(e_1) = 0. \quad (11)$$

The manager exerts effort up to the point where the change in the expected size of the division equals the marginal cost of effort provision. The first-order condition captures the allocative disadvantage, i.e. the "dark side", of the internal capital market. The headquarter reallocates the rise in cash flow generated by manager 1 across divisions so as to align the net-of-tax profitability of divisions. Effectively, the division loses a fraction of self-generated cash-flow

at the margin, independently of whether it has a low-performing or high-performing investment. Intuitively, a rise in cash-flow in division i decreases its net-of-tax marginal productivity of capital and, given the strict concavity of the production function, the headquarter restores (5) by reallocating capital to division j . The ex-post relocation of capital thereby undermines incentives to exert effort (e.g., Scharfstein and Stein, 2000, Brusco and Panunzi, 2005, and Inderst and Laux, 2005).

4.1 The MNE's Responses to Taxes

The endogeneity of managerial effort choices opens up two channels through which tax policy influences the allocation of capital. First, from the resource constraint, $X = k_1 + k_2$, it follows that the amount of capital draw-off one division experiences at stage 2 corresponds to the amount of capital that is given to the other division. So, any increase in the tax rate in country i causes a reallocation of capital of size¹⁰

$$\frac{\partial k_i}{\partial \tau_i} = -\frac{\partial k_j}{\partial \tau_i} < 0, \quad (12)$$

where the response is conditional on $X = x_i(e_i) + x_j(e_j)$. Second, tax policy also influences effort choices and thereby the amount of cash flow X which is shared between the two divisions. From (6) and (9), the response in effort levels following a tax change is¹¹

$$\frac{\partial e_i}{\partial \tau_i} < 0 \quad \text{and} \quad \frac{\partial e_j}{\partial \tau_i} > 0. \quad (13)$$

A rise in τ^i lowers effort provision in country i and increases it in country j . Intuitively, a rise in effort e_i increase the amount of capital that the headquarter allocates to division i . A higher tax rate τ^i incentivizes the headquarter to allocate less capital to that country. This reduces the sensitivity of the capital allocation to effort provision and thereby the marginal return to effort. On the contrary, the additional cash-flow allocated to country j raises the marginal return to effort in this country and, thereby, the level of effort that the manager in country j exerts.

The variation in the overall amount of effort provision, and thereby the total size of cash-flow $X = x_i(e_i) + x_j(e_j)$, depends on the productive endowment of country i relative to country j , as measured by $a_i - a_j$. The aggregate effort response is

$$\frac{\partial(e_1 + e_2)}{\partial \tau_i} \begin{matrix} \geq \\ \leq \end{matrix} 0 \Leftrightarrow \frac{\partial X}{\partial \tau_i} \begin{matrix} \geq \\ \leq \end{matrix} 0 \quad \text{iff} \quad a_i - a_j \begin{matrix} \leq \\ \geq \end{matrix} 0. \quad (14)$$

¹⁰The responses follow from differentiating (6) w.r.t. the tax rate in country i , keeping X constant.

¹¹All effort and cash flow responses to taxation are derived in the Appendix.

$a_i - a_j$ indicates the relative importance of the two divisions in generating cash flow which is redistributed through the internal capital market. When both countries are equally endowed ($a_i = a_j$), the counteracting effects of a rise in the tax rate on the division managers' effort provision offset and total cash flow X is insensitive to tax policy.¹² The neutrality finding does not extend to asymmetric endowments. When $a_i > a_j$, the redistribution of cash-flow towards country j implies a larger decline in the marginal return to effort for division manager in country i compared to the increase in the marginal return to effort that the division manager in country j experiences.¹³ In response, the total amount of cash flow falls. Conversely, when $a_i < a_j$, the marginal return to effort of the manager in the more amply endowed country rises more strongly. Consequently, the response in overall effort provision and cash flow is positive.

4.2 Tax Policy

Now, we turn to the welfare effects of non-cooperative profit taxation. The objective function of government i is (7) and the externality of its tax policy on country j 's welfare is given by (8) which, to simplify readability, is repeated here:

$$\gamma_j \frac{dE(\pi)}{d\tau_i} + \lambda_j \tau_j \frac{dE(TB_j)}{d\tau_i}. \quad (15)$$

The first term marks the tax exporting externality and the second term is the fiscal externality associated with country i 's tax policy. The externality term is qualitatively unchanged when $a_1 = a_2$. The reason is that the disincentive effect of the internal capital market is neutral for tax policy choices. Hence, the taxonomy of policy externalities is identical to the one which applies when the internal capital market incurs no efficiency costs to the MNE.

When $a_1 \neq a_2$, both types of externalities in (15) differ from those in the previous section. Turning to tax policy in country 1, we find a negative response of expected MNE profit following a tax increase in country 1:

$$\frac{dE(\pi)}{d\tau_1} = \left. \frac{\partial E(\pi)}{\partial \tau_1} \right|_{dX=0} + \frac{\partial E(\pi)}{\partial X} \frac{\partial X}{\partial \tau_1} < 0. \quad (16)$$

¹²When allowing for asymmetries related to the intensity of preferences for empire-building, θ , and the cost of effort provision, ω , the generalized condition for total effort provision to be insensitive to taxes is $\theta_i a_i / \omega_i = \theta_j a_j / \omega_j$. The term $\theta_i a_i / \omega_i$ summarizes the endowment characteristic of a country and personal characteristics of the manager in that country. It may be interpreted as the hedonic productivity of the manager in division i in generating cash flow.

¹³In a generalized model with heterogeneity in θ and ω , the condition reads $\theta_i a_i / \omega_i > \theta_j a_j / \omega_j$.

The response in MNE profits includes a mechanical and a behavioral response. The first term on the r.h.s. depicts the mechanical effect which is negative in sign. The second term captures the behavioral response which is due to the adjustment in managerial effort provision when $a_1 > a_2$. The total amount of cash flow, for which divisions compete in the internal capital market, becomes lower in this case, and so does the profitability of the MNE. Note, by an application of the envelope theorem, the change in the capital allocation by the headquarter at stage 2 does not affect profits of the MNE, as before.

The second term in (15) captures the change in country 2's tax base:

$$\frac{dE(TB_2)}{d\tau_1} = \left. \frac{\partial E(TB_2)}{\partial \tau_1} \right|_{dX=0} + \frac{\partial E(TB_2)}{\partial X} \frac{\partial X}{\partial \tau_1} > 0. \quad (17)$$

The sign of the change reflects the interplay of the capital re-allocation through the headquarter to the division in country 2 (first term on the r.h.s.), which positively affects country 2's tax base, and the cash-flow disincentive effect (second term) which, for $a_1 > a_2$, induces a decline in the overall amount of effort and therewith of cash-flow that is available in the internal capital market. The disincentive effect exerts a negative effect on country 2's tax base. Straightforwardly, the stronger the cash-flow disincentive effect, the more attenuated becomes the tax base externality. It, however, will not change its sign. The disincentive effect follows from the capital re-allocation by the headquarter and, thereby, is of second-order. The combined effect is positive.

Isolating the role of effort provision for the efficiency of tax choices, the managerial effort response magnifies the negative tax exporting externality and counteracts the positive tax base externality which directly follows from the relocation of capital in response to a tax change. As such, a pre-existing inefficiency related to undertaxation (overtaxation) tends to become less (more) severe when the endogeneity of effort choices is accounted for.

Differently, when country 2 increases its tax rate, the tax-induced reallocation of cash-flow causes an increase in the overall amount of effort when $a_1 > a_2$, c.f. (14). More cash-flow is available in the internal capital markets to be distributed between the two divisions which generates a positive fiscal externality in country 1. Combined with the re-allocation of capital to division 1, the tax base in country 1 increases following a tax rise in country 2. Thus,

$$\frac{dE(TB_1)}{d\tau_2} = \left. \frac{\partial E(TB_1)}{\partial \tau_2} \right|_{dX=0} + \frac{\partial E(TB_1)}{\partial X} \frac{\partial X}{\partial \tau_2} > 0. \quad (18)$$

The response of expected MNE profit to a change in τ_2 is

$$\frac{dE(\pi)}{d\tau_2} = \frac{\partial E(\pi)}{\partial \tau_2} \Big|_{dX=0} + \frac{\partial E(\pi)}{\partial X} \frac{\partial X}{\partial \tau_2} \stackrel{\geq}{\leq} 0. \quad (19)$$

The positive behavioral response (i.e., the cash-flow incentive effect) counteracts the negative mechanical response which renders the overall sign of the externality ambiguous. However, to the extent that (i) the mechanical response dominates the behavioral response or (ii) country 2 operates on the upward-sloping part of its local revenue hill, the tax exporting externality turns out to be negative.¹⁴

Compared with the efficiency results in the absence of effort choices, the magnitude of the two policy externalities change in opposite directions. The negative tax-exporting effect is ameliorated while the positive tax base externality rises. The consequence is that the adjustment in managerial behavior exerts a positive externality on welfare in country 1.

We can summarize the impact of the disincentive effect on the efficiency of tax policy as follows:

Proposition 2: *Assume managers exert effort to produce cash flow. (i) When both countries are equally endowed, the (dis)incentive effect of the internal capital market is neutral for tax policy. Proposition 1 applies. (ii) When countries are differently endowed, the managerial behavior modifies the tax exporting and fiscal externality. In particular, the disincentive effect of the internal capital market in isolation incentivizes the country which is more (less) amply endowed to choose higher (lower) profit taxes.*

The tax differential $\tau_i - \tau_j$ is systematically related to the tax-induced effort choice adjustments. Their impact on domestic welfare coincides in sign for both countries. The drop in effort following a rise in country 1's tax rate lowers MNE profit, which reduces shareholder wealth in both countries, and lowers both countries' tax bases. Given the 'public good' character of domestic tax policy, the associated externality is equal in sign to the 'internality', i.e. the effect on domestic welfare the government accounts for in its policy choice. Effort adjustments reduce taxing incentives in country 1, ceteris paribus, and conversely strengthens taxing incentives in

¹⁴To verify the theoretical underpinning of the second requirement, note that the first-order condition for country 2's tax choice is

$$\gamma_2 dE(\pi)/d\tau_2 + \lambda_2 (E(TB_2) + \tau_2 dE(TB_2)/d\tau_2) = 0.$$

When the second term is positive, the tax effect on total MNE profit must be negative at an interior tax rate choice.

country 2. Provided this first-order impact of effort changes on taxing incentives dominates, the tax differential between both countries is predicted to widen, provided it is positive in the absence of effort choices, and to narrow otherwise.

Nielsen et al. (2010) show that the provision of a common input (e.g., blue prints) by the headquarter of a MNE introduces a tendency to “overtax” local divisions. We should emphasize that the mechanism we propose here is different to the one underlying the choice of a common input. The cash provision by managers is akin to a private provision of a public good in a MNE (viewed from an ex-ante perspective), whereas the choice of common inputs by the headquarter is akin to a public provision of a public good. The two types of mechanisms lead to different outcomes. Whereas the cash provision in isolation may lead to inefficiently high or low taxes, the tax-efficient use of a common input unambiguously points towards overtaxation. Relatedly, the way the associated tax spill-overs operate between countries is through the relocation of capital in the present paper and the complementarity of production factors (capital and the common input) in Nielsen et al.

5 Infrastructure Investment

In this section, we endogenize the amount of infrastructure in each country by allowing governments to choose a_i independently. Different to the model in the previous section, stage 0 of the game now involves that countries engage in fiscal competition by setting their tax rates and investment expenditures non-cooperatively. The other stages of the model stay the same.

Differentiating (5) w.r.t. a_i , the direct effect of a_i on the capital allocation at stage 2 is

$$\frac{\partial k_i}{\partial a_i} > 0 \quad \text{and} \quad \frac{\partial k_j}{\partial a_i} > 0. \quad (20)$$

A more generous infrastructure provision in country i increases the productivity of effort in division i . In response, more capital is available in the internal capital market which can be shared between the two divisions.

Following (6) and (11), the increase in the productivity of effort in division i incentivizes manager i to raise the effort level, while manager j leaves the effort choice unchanged, as his productivity does not rise, i.e.

$$\frac{\partial e_i}{\partial a_i} > 0 \quad \text{and} \quad \frac{\partial e_j}{\partial a_i} = 0. \quad (21)$$

The headquarter distributes the associated rise in capital across the two divisions in excess of what the direct effect (20) implies. Hence,

$$\frac{dk_\iota}{da_i} = \frac{\partial k_\iota}{\partial a_i} + \frac{\partial k_\iota}{\partial e_i} \frac{\partial e_i}{\partial a_i} > 0 \quad \iota = 1, 2. \quad (22)$$

Note, from (6), $\partial k_\iota / \partial e_i > 0$.

At stage 0, government i chooses a_i to maximize welfare of the local population. The welfare measure is (7), modified to account for infrastructure expenditure

$$\gamma_i E(\pi) + \lambda_i (\tau_i E(TB_i) - a_i) \quad \text{with } \lambda_i > 1. \quad (23)$$

Tax revenue net of infrastructure expenditure is spent on a consumption good which is valued by local residents at rate $\lambda_i > 1$ per unit of consumption spending.

As in the last section, we are interested in singling out the implications of the agency problem for the efficiency of decentralized policy choices. To this end, we look at the impact of country i 's infrastructure policy on welfare in country j , as given by

$$\gamma_j \frac{dE(\pi)}{da_i} + \lambda_j \tau_j \frac{dE(TB_j)}{da_i}. \quad (24)$$

Disentangling the first term in (24), the effect on profits of the multinational firm is

$$\frac{dE(\pi)}{da_i} = \left. \frac{\partial E(\pi)}{\partial a_i} \right|_{de_i=0} + \frac{\partial E(\pi)}{\partial e_i} \frac{\partial e_i}{\partial a_i} > 0. \quad (25)$$

The first term is the positive mechanical effect of a higher infrastructure spending on MNE profit. The agency problem adds a second effect. The rise in effort in country i , that follows from infrastructure provision, equally increases profits which partially accrue to residents in county j .

As to the tax base change in country j , we find

$$\frac{dE(TB_j)}{da_i} = \left. \frac{\partial E(TB_j)}{\partial a_i} \right|_{de_i=0} + \frac{\partial E(TB_j)}{\partial e_i} \frac{\partial e_i}{\partial a_i} > 0. \quad (26)$$

A more generous infrastructure spending a_i directly increases the capital allocation in country j , as captured by the first term. The associated rise in tax revenues is reinforced through the effort increase in country i , c.f. (22). Thus, we can summarize:

Proposition 3: *In an uncoordinated equilibrium, infrastructure spending generates a positive tax-exporting and fiscal externality. In particular, the two externalities are positive in the*

absence of discretionary behavior by managers and are both reinforced through the change in managerial behavior in response to infrastructure spending.

Proposition 3 shows that infrastructure spending is inefficiently low in competition for MNE profits. The result differs from the conventional finding that infrastructure spending is inefficiently high in fiscal competition, e.g., Keen and Marchand (1997). Therein, countries use infrastructure spending to lure more capital to the jurisdiction, at the expense of capital investments in other countries. An internal capital market modifies the sign of the spill-over. It generates a positive spill-over since the return to infrastructure policy (higher cash flow) is shared between both division through the re-allocation of capital by the headquarter.

The uncoordinated Nash equilibrium is inherently asymmetric w.r.t. the level of infrastructure in each country. Most notably, the ownership share, γ_i , and the preference for public consumption spending, λ_i , may differ across countries and so will the amount of infrastructure each country provides in equilibrium. An equilibrium infrastructure differential $a_i - a_j \neq 0$ renders the agency cost sensitive to tax rate changes, c.f. (14). In consequence, managerial behavior generically influences the uncoordinated equilibrium choice of profit taxes, as summarized by part (ii) and (iii) of Proposition 2.

6 Endogeneity of Internal Capital Markets

Headquarters may decide on how strongly divisions are financially integrated through an internal capital market. For instance, division may operate on a stand-alone basis where investment outlays are only financed by, e.g., retained earnings of the division. In this case, the headquarter loses the flexibility to re-allocate funds in response to productivity shocks in each division, but also saves on the agency cost inherent to an internal capital market. In this section, we analyze the incentive by MNEs to create an internal capital market and how the incentive relates to profit taxation. Consider there is a continuum of MNEs which differ w.r.t. the range of the productivity differential $\Delta = \bar{\alpha} - \underline{\alpha}$. The productivity differential is distributed on $[0, \bar{\Delta}]$ with density $g(\Delta) > 0$ for $\Delta \in [0, \bar{\Delta}]$. The model extension reflects the observation that firms operate in differently risky business environments and are hence exposed to a different range of productivity shocks. Thereby, Δ indicates the magnitude of the productivity gain associated with a relocation of capital through an internal capital market.

The timing of decisions is as follows: At stage 0, the two jurisdiction engage in fiscal competition and set their tax rates non-cooperatively. At stage 1, each multinational headquarter decides on whether to set up an internal capital market. At stage 2, each division manager chooses the effort level e_i which determines the amount of cash-flow x_i , available in division i . At stage 3, the headquarter and the division managers learn the divisions' profitability and, provided an internal capital market has been set up at stage 1, the headquarter re-allocates resources, i.e. cash-flow $x_1 + x_2$, across divisions so as to enhance the overall profitability of the MNE. Finally, production takes place and the firm is liquidated. We solve the game by backward induction.

We first turn to the managerial effort choices in a MNE without an internal capital market. Division manager 1 solves

$$\max \theta(p\bar{k}_1 + (1-p)\underline{k}_1) - \phi(e_i) \quad \text{s.t.} \quad \bar{k}_1 = \bar{\alpha}(a_i e_i)^\beta \quad \text{and} \quad \underline{k}_1 = \underline{\alpha}(a_i e_i)^\beta. \quad (27)$$

Two observations emerge. First, managers do not have to share the return to effort with the other division through the internal capital market. In response, they will exert more effort, a positive incentive effect which is a mirror image of the dark side of the internal capital market. Second, the managerial choice problem is independent of profit taxes and so is the managerial effort choice and the level of gross profits in each division.¹⁵ Division manager 2's decision problem and the associated division profit are analogues.

Denoting the expected profit level before taxes of a stand-alone division and a division, which is integrated in an internal capital market (see section 4), by $E(\Phi^S)$ and $E(\Phi^I)$, respectively, the headquarter decides to set up an internal capital market if and only if

$$(1 - \tau_i)E(\Phi_i^S) + (1 - \tau_j)E(\Phi_j^S) < (1 - \tau_i)E(\Phi_i^I) + (1 - \tau_j)E(\Phi_j^I). \quad (28)$$

MNEs differ w.r.t. the range of the productivity realization $\bar{\alpha} - \underline{\alpha}$. Hence, MNEs which operate in industries with a high productivity differential will opt for an internal capital market. Their benefit of equalizing the marginal productivity of capital (net of tax) across divisions is high relative to the cost that take the form of diluted managerial incentives to generate cash flow.¹⁶

¹⁵The result is sensitive to whether first-period output (cash flow) is taxed. Straightforwardly, when cash flow is taxed in the first period, effort choices will be negatively influenced by the first-period profit tax. This would also apply to the managerial effort choices when an internal capital market is in place, thereby not qualitatively influencing the decision whether to set up an internal capital market.

¹⁶A MNE with $\Delta = 0$ will not opt for an internal capital market. We assume that $\bar{\Delta}$ is sufficiently large such that the cut-off differential Δ^* is interior, i.e. $\Delta^* \in (0, \bar{\Delta})$.

To analyze how the decision to set up an internal capital market is affected by profit taxes, we differentiate both sides of (28) w.r.t. the profit tax in country i :

$$-E(\Phi_i^S) \stackrel{\geq}{\leq} -E(\Phi_i^I) + \left((1 - \tau_i) \frac{dE(\Phi_i^I)}{d(e_i + e_j)} + (1 - \tau_j) \frac{dE(\Phi_j^I)}{d(e_i + e_j)} \right) \frac{d(e_i + e_j)}{d\tau_i}. \quad (29)$$

The first term on both sides is the mechanical effect of a higher tax. Agency costs influence the decision margin as captured by the second term on the right-hand side. Taken in isolation, more firms will shift towards internal capital markets if total effort provision rises with the profit tax and vice versa. As shown above, the response in aggregate effort provision in the MNE is positive if $a_i < a_j$ and negative if $a_i > a_j$, c.f. (14). Hence,

Proposition 4: *Following a tax rise in one country, a MNE tends to set up an internal capital market when total cash flow in the financially-integrated MNE rises in response to the higher tax rate. This is the case when the infrastructure endowment in the tax-raising country is relatively small.*

Proposition 4 may be surprising. An internal capital market provides more flexibility in avoiding taxes. One may hence expect that MNEs will expand their options to avoid taxes when the profit tax burden rises. Proposition 4 shows that MNE will only opt for an internal capital market when the country in which the tax is raised is relatively poorly endowed in terms of infrastructure. As such, it appears that in particular infrastructure-rich and high-tax countries will host divisions which are less financially-integrated with other divisions of the MNE. The reason is that generous infrastructure provision creates a second dark side of internal capital markets. An internal capital market not only undermines incentives to exert effort, for a given level of taxes, but also reduces total effort provision in response to a tax hike in the amply-endowed division location.

In this setting, a MNE which does not run an internal capital market gives rise to a negative mechanical tax-exporting externality. Hence, using the findings in Section 4, the adjustment in the extensive margin following a tax rate hike generates an ambiguous policy externality. Agency costs influence the policy externality as follows. Proposition 2 and 4 show that a tax rise in a poorly-endowed country incentivizes MNEs to create financial linkages between divisions which in itself pressures profit taxes below their efficient level. Conversely, the adjustment in the extensive margin of MNE behavior counteracts the downward pressure on profit taxes of the

amply-endowed country.

7 Conclusion

In this paper we analyze how investment responses by MNEs shape the efficiency of tax choices in fiscal competition. Unlike previous literature, we look at MNEs which run an internal capital market which not only allows them to choose a tax-efficient allocation of capital, but also imposes agency costs on the MNE. Accounting for the agency cost of internal capital markets provides a more thorough understanding of how countries compete in taxes. In particular, we show that profit taxes influence the effort provision by division managers and cash flow for which division compete in the internal capital market. The tax effects mediated through effort choices might lead to inefficiently high profit taxes and to an inefficiently low provision of infrastructure.

A recurrent theme in the literature on tax competition and MNEs is how a country's tax base is related to profits of the MNE, see, e.g., Gordon and Wilson (1986) and Nielsen et al. (2010). While the principle of separate accounting, which we adopt in the paper, is the dominant rule for MNEs with cross-national operations, there are policy discussions to adopt a formula-based apportionment rule instead. In our model, capital weights can be used to implement such a formula-based system. An analysis of the relative efficiency effects of the two systems and the role of agency costs is analytically involved, however. A focus on symmetric tax competition equilibria, as commonly adopted in the literature, would eliminate the role of agency costs for tax competition in our setting. Hence, such a comparison must be pursued for asymmetric equilibria.¹⁷ We leave a formal analysis of this and other interesting extensions to future research.

A Derivation of Effort Choice Responses (13) and (14)

Denoting

$$\bar{\delta}_i = \left(1 + \left(\frac{(1 - \tau_j)\underline{\alpha}}{(1 - \tau_i)\bar{\alpha}} \right)^{\frac{1}{1-\beta}} \right)^{-1} \quad \text{and} \quad \underline{\delta}_i = \left(1 + \left(\frac{(1 - \tau_j)\bar{\alpha}}{(1 - \tau_i)\underline{\alpha}} \right)^{\frac{1}{1-\beta}} \right)^{-1} \quad (30)$$

¹⁷In our basic setting, countries may be different in terms of γ_i, p, λ_i and a_i . Simplifying the analysis by imposing full symmetry, i.e. $p = \gamma_i = 0.5$, $\lambda_1 = \lambda_2$, and $a_1 = a_2$, eliminates equilibria in which the (dis)incentive effect of internal capital markets interacts with policy choices. These equilibria only prevail when $a_i \neq a_j$, i.e. when asymmetries exist.

as the share of cash flow which is allocated to the high-performing division and low-performing division in country i , we can use (6) to write the first-order condition (11) as

$$\theta (p\bar{\delta}_1 a_1 + (1-p)\underline{\delta}_1 a_1) - \omega e_1 = 0. \quad (31)$$

Differentiating (31) w.r.t. τ_i and rearranging we get

$$\frac{\partial e_1}{\partial \tau_i} = \frac{\theta}{\omega} \left(p \frac{\partial \bar{\delta}_1}{\partial \tau_i} a_1 + (1-p) \frac{\partial \underline{\delta}_1}{\partial \tau_i} a_1 \right). \quad (32)$$

Analogously, we find

$$\frac{\partial e_2}{\partial \tau_i} = \frac{\theta}{\omega} \left(p \frac{\partial \underline{\delta}_2}{\partial \tau_i} a_2 + (1-p) \frac{\partial \bar{\delta}_2}{\partial \tau_i} a_2 \right). \quad (33)$$

Note, from (30), that $\text{sign}\{\partial \bar{\delta}_i / \partial \tau_j\} = \text{sign}\{\partial \underline{\delta}_i / \partial \tau_j\} < 0$ if $i = j$ and $\text{sign}\{\partial \bar{\delta}_i / \partial \tau_j\} = \text{sign}\{\partial \underline{\delta}_i / \partial \tau_j\} > 0$ if $i \neq j$. Thus, (13) holds.

Using the individual effort responses, total effort provision changes as follows:

$$\frac{\partial(e_1 + e_2)}{\partial \tau_i} = \frac{\theta}{\omega} \left(p \left(\frac{\partial \bar{\delta}_1}{\partial \tau_i} a_1 + \frac{\partial \underline{\delta}_2}{\partial \tau_i} a_2 \right) + (1-p) \left(\frac{\partial \underline{\delta}_1}{\partial \tau_i} a_1 + \frac{\partial \bar{\delta}_2}{\partial \tau_i} a_2 \right) \right). \quad (34)$$

Consider first $a_1 = a_2$. Since, from (30), $\bar{\delta}_i + \underline{\delta}_j = 1$ and thus $\partial \bar{\delta}_i / \partial \tau_i + \partial \underline{\delta}_j / \partial \tau_i = 0$, the total effort response (34) is zero and so is the cash flow response $\partial X / \partial \tau_i$.

Differently, consider $a_1 > a_2$. Now, since $\partial \bar{\delta}_i / \partial \tau_i + \partial \underline{\delta}_j / \partial \tau_i = 0$, total effort provision decreases if the response (34) is evaluated for $i = 1$ and increases if the response is evaluated for $i = 2$. Finally, the cash flow response $\partial X / \partial \tau_i$ coincides in sign with the total effort response. Hence, (14) holds.

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